SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the furnishing, installation, and connection of exterior luminaires, and supports.

1.2 RELATED WORK

A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.

B. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low voltage power and lighting wiring.

C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

1.3 QUALITY ASSURANCE

Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

B. Shop Drawings:

1. Clearly present sufficient information to determine compliance with drawings and specifications.
2. Include electrical ratings, dimensions, mounting, details, materials, required clearances, terminations, wiring and connection diagrams, photometric data, LED driver, luminaires, LED lamps, and accessories. Include electronic photometric files in IES format, or provide link (URL) to manufacturer’s website that contains photometric data for each specific fixture used.

C. Manuals: Two weeks prior to final inspection, submit four copies of operating and maintenance manuals to the COTR. Include technical data sheets, wiring and connection diagrams, and information for ordering replacement LED lamps, LED driver, and parts.

D. Certifications: Two weeks prior to final inspection, submit four copies of the following to the COTR:

1. Certification by the manufacturer that the materials are in accordance with the drawings and specifications.

2. Certification by the contractor that the complete installation has been properly installed and tested.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. Aluminum Association Inc. (AA):

AAH35.1-06.....Alloy and Temper Designation Systems for Aluminum

C. American Association of State Highway and Transportation Officials (AASHTO):

LTS-5-09 .....Structural Supports for Highway Signs, Luminaires and Traffic Signals

D. American Concrete Institute (ACI):

318-05 .....Building Code Requirements for Structural Concrete

E. American National Standards Institute (ANSI):

C81.61-09 .....Electrical Lamp Bases – Specifications for Bases (Caps) for Electric Lamps

F. American Society for Testing and Materials (ASTM):

A123/A123M-09 .....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-09.....Zinc Coating (Hot-Dip) on Iron and Steel Hardware

B108-03a-08 .....Aluminum-Alloy Permanent Mold Castings

G. Illuminating Engineering Society of North America (IESNA)

HB-9-00.....Lighting Handbook

RP-8-05.....Roadway Lighting

RP-33-99.....Lighting for Exterior Environments

LM-5-96.....Photometric Measurements of Area and Sports Lighting Installations

LM-72-97.....Directional Positioning of Photometric Data

LM-79-08.....Approved Method for the Electrical and Photometric Measurements of Solid-Sate Lighting Products

LM-80-08.....Approved Method for Measuring Lumen Maintenance of LED Light Sources

H. National Electrical Manufacturers Association (NEMA):

ICS 2-00 (R2005) .....Controllers, Contactors and Overload Relays Rated 600 Volts

ICS 6-93 (R2006) .....Enclosures

I. National Fire Protection Association (NFPA):

70-Latest Edition .....National Electrical Code (NEC)

J. Underwriters Laboratories, Inc. (UL):

1598-08 .....Luminaires

8750-08.....Light Emitting Diode (LED) Light Sources for Use in Lighting Products

1.6 DELIVERY, STORAGE, AND HANDLING

Provide manufacturer’s standard provisions for protecting bollard lights and flood lights during transport, storage, and installation. Do not store bollard lights and flood lights on ground. Store bollard and flood lights so they are at least 12 in [305 mm] above ground level and growing vegetation. Do not remove factory-applied bollard and flood light wrappings until just before installing bollard lights.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be in accordance with NEC, UL, ANSI, and as shown on the drawings and specified.

2.2 BOLLARD AND FLOOD LIGHTS

A. General:

1. Bollard and flood lights shall be as shown on the drawings, and as specified. Finish shall be as specified on the drawings.
2. Bollard light shall be anchor-bolt type designed for use with underground supply conductors.
3. Flood light shall be threaded adjustable knuckle mounting designed for use with underground supply conductors.
4. Provide a steel-grounding stud, designed to prevent electrolysis when used with copper wire.
5. Hardware and Accessories: All necessary hardware and specified accessories shall be the product of the bollard light manufacturer.
6. Provide manufacturer's standard finish, as scheduled on the drawings.

2.3 FOUNDATIONS FOR OUTDOOR LGIHTS

A. Foundations shall be cast-in-place concrete, having 3000 psi minimum 28-day compressive strength.

B. Foundations shall support the luminaire(s), and accessories.
C. Place concrete in spirally-wrapped treated paper forms for round foundations, and construct forms for square foundations.
D. Rub-finish and round all above-grade concrete edges to approximately 0.34 in [19 mm] radius or as shown on drawings.
E. Anchor bolt assemblies and reinforcing of concrete foundations shall be as shown on the drawings. Anchor bolts shall be in a welded cage or properly positioned by the tiewire to stirrups.
F. Prior to concrete pour, install electrode per Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS or as shown on drawings.

2.4 LUMINAIRES

A. Per UL 1598 and NEMA C136.17. Luminaires shall be weatherproof, corrosion resistant, heavy duty, outdoor types designed for efficient light utilization, adequate dissipation of lamp and driver heat, and safe cleaning and relamping.
B. Light distribution pattern types shall be as shown on the drawings.
C. Incorporate LED driver in the luminaire housing, except where otherwise shown on the drawings.
D. Lenses shall be as shown on the drawings.
E. Pre-wire internal components to terminal strips at the factory.
F. Luminaires shall have leveling provisions.
G. Materials shall be rustproof.
H. Provide manufacturer's standard finish, as scheduled on the drawings.
I. Luminaires shall carry factory labels, showing complete, specific lamp and driver information.

2.5 LAMPS

A. Install the proper lamps in every luminaire installed.
B. Lamps shall be general-service, outdoor lighting types.
C. LED sources shall meet the following requirements:
   1. Operating temperature rating shall be between -40˚ F [-40˚ C] and 120˚ F [50˚ C].
   2. Correlated Color Temperature (CCT): 4000K and above.
   3. Color Rendering Index (CRI): ≥ 65.
   4. The manufacturer shall have performed JEDEC (Joint Electron Devices Engineering Council) reliability tests on the LEDs as follows: High Temperature Operating Life (HTOL), Room Temperature Operating Life (RTOL), Low Temperature Operating Life (LTOL), Powered Temperature

Cycle (PTMCL), Non-Operating Thermal Shock (TMSK), Mechanical Shock Variable Vibration Frequency, and Solder Heat Resistance (SHR).//

D. Mercury vapor lamps shall not be used.

2.6 LED DRIVERS

A. LED drivers shall meet the following requirements:

1. Drivers shall have a minimum efficiency of 85%.
2. Starting Temperature: -40˚ F [-40˚ C].
3. Input Voltage: 120 to 480 (±10%) V.
4. Power Supplies: Class I or II output.
5. Surge Protection: The system must survive 250 repetitive strikes of "C Low" (C Low: 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. "C Low" waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.
6. Power Factor (PF): ≥ 0.90.
7. Total Harmonic Distortion (THD): ≤ 20%.
8. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.
9. Drivers shall be reduction of hazardous substances (ROHS)-compliant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lighting in accordance with the NEC, as shown on the drawings, and in accordance with manufacturer's recommendations.

B. Light Foundations:

1. Excavate only as necessary to provide sufficient working clearance for installation of forms and proper use of tamper to the full depth of the excavation. Prevent surface water from flowing into the excavation. Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath, and the end of conduit.
2. Set anchor bolts according to anchor-bolt templates furnished by the bollard light manufacturer.
3. Install lights as necessary to provide a permanent vertical position.
4. After the light have been installed, shimmed, and plumbed, grout the spaces between the light bases and the concrete base with non-shrink concrete grout material. Provide a plastic or copper tube, of not less than 0.375 in [9 mm] inside diameter through the grout, tight

to the top of the concrete base to prevent moisture weeping from the interior of the light.

C. Install luminaire.

D. Adjust luminaires that require field adjustment or aiming.

3.2 GROUNDING

Ground noncurrent-carrying parts of equipment, including luminaires, and metallic enclosures, as specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS. Where copper grounding conductor is connected to a metal other than copper, provide specially-treated or lined connectors suitable and listed for this purpose.

3.3 ACCEPTANCE CHECKS AND TESTS

Verify operation after installing luminaires and energizing circuits.

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